Work Order ID 81518

March-15-12 8:43:03 AM

81518

U/R

Item ID: D350-748-101 (POSITIVE RECALL)
Revision ID: ~~U/R~~
Item Name: Crosstube Installation, High Fwd

Start Date: 15/03/2012 **Start Qty:** 1.00 *1*
Required Date: 04/04/2012 **Req'd Qty:** 1.00 *1*
Reference:

Accept *N900040100*

Setup Start *NS1* Stop *NS2*

Cust Item ID:
Customer:

Run Start *NR1* Stop *NR2*

Approvals: **Process Plan:** MLJ **Date:** 12/03/15 **Tooling:** **Date:**
QC: **Date:** **SPC (Y/N):** **Date:**

Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
Draw Nbr	**Revision Nbr**								
D350-748-141	F ~~U/R~~ OK 12.03.15								
100		0.00							
100	DOCUMENT CONTROL					1			12 05 23
DC	**Memo**	0.00							
Document Control	Photocopy bluefile & type labels per PPPD350-748-101		CHG002						for MLJ 12-5-23
110		0.00							
110	BENDING MACHINE - CROSSTUBES								12-4-4
CNC Bend 1	**Memo**	0.00							
CNC Delta 100 Bender	Bend tube as per Dwg D350-748-141 using CNC bender program D350F and Folio FT_____								
120	QC15- Crosstube Dimensional Check	0.00							
120									12.04.11
QC	**Memo**	0.00							
Quality Control									

→

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W/O: 81578	WORK ORDER CHANGES						
DATE	**STEP**	**PROCEDURE CHANGE**	**By**	**Date**	**Qty**	**Approval** Chief Eng / Prod Mgr	**Approval** QC Inspector

Part No: D350-748-101 **PAR #:** _____ **Fault Category:** X-tube **NCR:** (Yes) No **DQA:** ~~Yes~~ **Date:** 12/05/30

Resolution: Rework **Disposition:** Rework **QA: N/C Closed:** CK **Date:** 12/5/31

NCR: 12-1469	WORK ORDER NON-CONFORMANCE (NCR)							
DATE	**STEP**	**Description of NC** Section A	**Corrective Action** Section B			**Verification** Section C	**Approval** Chief Eng	**Approval** QC Inspector
			Initial Chief Eng	**Action Description** Chief Eng	**Sign & Date**			
12.04.11	110	Bent high & narrow	CP 12.04.11 QS1642	TRIM TO 23.40" high.	MO 12-4-18	TW 12-4-18	CP 12.04.11 QS1642	S 12/05/29
12.04.11	170	Tube is excessively narrow	CP 12.04.11 QS1642	ENG APPROVE DIMS AFTER CAD PLATE Acceptable CP 12.05.29	CP 12.5.29	S 12/05/30	CP 12.05.29	S 12/05/30
12/04/17	# 110	Found dll to be ovalized Rads from 0.060" to 0.100" R.C. Heat treat method	CP 12.04.19 QS1642	Rework as per attached email original cust min 2.196" max 2.277" after rework min 2.227" max 2.250"	12.04.18	RM	CP 12.04.19 QS1642	12/04/17

NOTE: Date & initial all entries

Item ID: D350-748-101 **Accept** *N900040100* **Setup Start** *NS1*
Revision ID: U/R **Stop** *NS2*
Item Name: Crosstube Installation, High Fwd
Start Date: 15/03/2012 **Start Qty:** 1.00 *1*
Required Date: 04/04/2012 **Req'd Qty:** 1.00 *1*
Reference:
Cust Item ID:
Customer:

Run Start *NR1*
Stop *NR2*

Approvals: **Process Plan:** **Date:** **Tooling:** **Date:**
QC: **Date:** **SPC (Y/N):** **Date:**

Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
125		0.00							
125 HandFXtube Rework						CL	12/04/04	1	
Hand Finishing Crosstubes	**Memo** ***Stress relief*** Heat treat crosstube as per QSI010 4.3 Temp:_____ Start time:_____ Finish time:_____	0.00							
127	QC6- Inspect dimensions to drawing	0.00							
127 QC Quality Control	**Memo**	0.00							

Issue P/O to Metcan
P/O: 16638
Per DRO D350-748-141 F-1
CP 12.04.11 D

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W/O:		WORK ORDER CHANGES					
DATE	**STEP**	**PROCEDURE CHANGE**	**By**	**Date**	**Qty**	**Approval** Chief Eng / Prod Mgr	**Approval** QC Inspector

Part No: _____ **PAR #:** _____ **Fault Category:** _____ **NCR:** Yes (No) **DQA:** _____ **Date:** _____

Resolution: _____ **Disposition:** _____ **QA: N/C Closed:** _____ **Date:** _____

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	**STEP**	**Description of NC** Section A	**Corrective Action** Section B			**Verification** Section C	**Approval** Chief Eng	**Approval** QC Inspector
			Initial Chief Eng	**Action Description** Chief Eng	**Sign & Date**			
	110	Tube crushing after bending is over tolerance	12.04.19	Acceptable per attached SK	N/A	12/04/23	12.04.19	12/05/23

NOTE: Date & initial all entries

Item ID: D350-748-101 **Accept** *N900040100* **Setup Start** *NS1*
Revision ID: U/R **Stop** *NS2*
Item Name: Crosstube Installation, High Fwd

Start Date: 15/03/2012 **Start Qty:** 1.00 *1*
Required Date: 04/04/2012 **Req'd Qty:** 1.00 *1*
Reference:

Cust Item ID:
Customer:

Run Start *NR1*
Stop *NR2*

Approvals: **Process Plan:** **Date:** **Tooling:** **Date:**
QC: **Date:** **SPC (Y/N):** **Date:**

Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
130		0.00							
130	Crosstubes								
Crosstubes	**Memo**	0.00							
Crosstubes	1-Drill Tube as per Dwg D350-748-141 Using DT8876 A,B &C Drill Jigs, Set-up drill table as per QSI 010 2-Deburr 3-Engrave Part # and Batch # as per Dwg D350-748-141 4-Remove all marks from tube within limits of D350-748-141 5- Apply a light coat of LPS3 on the interior of tube Batch: N/A								
140	QC5- Inspect part completeness to step on W/O	0.00							
140									
QC	**Memo**	0.00							
Quality Control	CHECK 10 DEG HOLES WITH DT8876E (EUROCOPTER CLAMP)								

JW 12-04-23
MO 12-4-23
Sr 12/4/25

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W/O:		WORK ORDER CHANGES					
DATE	**STEP**	**PROCEDURE CHANGE**	**By**	**Date**	**Qty**	**Approval** Chief Eng / Prod Mgr	**Approval** QC Inspecter

Part No: _____ **PAR #:** _____ **Fault Category:** _____ **NCR:** Yes No **DQA:** _____ **Date:** _____

Resolution: _____ **Disposition:** _____ **QA: N/C Closed:** _____ **Date:** _____

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	**STEP**	**Description of NC** Section A	**Corrective Action** Section B			**Verification** Section C	**Approval** Chief Eng	**Approval** QC Inspector
			Initial Chief Eng	**Action Description** Chief Eng	**Sign & Date**			

NOTE: Date & initial all entries

Work Order ID 81518

81518

March-15-12 8:43:03 AM

Item ID: D350-748-101 **Accept** *N900040100* **Setup Start** *NS1*
Revision ID: U/R **Stop** *NS2*
Item Name: Crosstube Installation, High Fwd

Start Date: 15/03/2012 **Start Qty:** 1.00 *1* **Cust Item ID:**
Required Date: 04/04/2012 **Req'd Qty:** 1.00 *1* **Customer:**
Reference:

Approvals: **Process Plan:** **Date:** **Tooling:** **Date:** **Run Start** *NR1*
QC: **Date:** **SPC (Y/N):** **Date:** **Stop** *NR2*

Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
150	Outsource process-Cadplate per QSI017 4.1.9.1	0.00							
150									
Outsource3	**Memo**	0.00							
Outsource process - Cad plate	Issue P/O: 16826 Stress relief at 375° for 5 hours Magnetic Particle Inspect per ASTM E1444 Cadium Plate per AMS-QQ-P-416B, Class 1, Type 2 Embrittle relief at 375° for 8 hours, Chromate Treat Possibe Supplier: Southwest United Industries Ensure Certificate of Conformity is attached								
160	Receive & Inspect for Damage & Mat'l Certs	0.00							
160									
Packaging	**Memo**	0.00							
Packaging	Ensure certificate of conformity is attached								
170	QC5- Inspect part completeness to step on W/O	0.00							
170									
QC	**Memo**	0.00							
Quality Control									

CL 12/04/25 (1)

12/05/22

12/05/15 (1)

12/05/22 (1)

12.05.22

★ SEE W/O CHG OVER

POSITIVE RECALL
EFFECTIVE 12.8.15 AUTH CL
RELEASED 12.05.22 DATE CL

Purch: issue P/O to Accuren P/O: 17031 CL 12/05/22

Insp'd: Insp'd & inspect attached cfc to W/O CL 12/05/22

FOR LOAD TEST & BEND DIMS

Dart Aerospace Ltd

W/O: 81518		WORK ORDER CHANGES					
DATE	**STEP**	**PROCEDURE CHANGE**	**By**	**Date**	**Qty**	**Approval** Chief Eng / Prod Mgr	**Approval** QC Inspector
12.03.15	171	LOAD TEST TO 3500 lb FOR 1 MINUTE				CP 12.03.15 QS1642	
12.03.15	172	NDT				CP 12.03.15 QS1642	

Part No: D350-748-101 **PAR #:** _____ **Fault Category:** _____ **NCR:** Yes No **DQA:** _____ **Date:** _____

Resolution: _____ **Disposition:** _____ **QA: N/C Closed:** _____ **Date:** _____

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	**STEP**	**Description of NC** Section A	**Corrective Action** Section B			**Verification** Section C	**Approval** Chief Eng	**Approval** QC Inspector
			Initial Chief Eng	**Action Description** Chief Eng	**Sign & Date**			

NOTE: Date & initial all entries

Dart Aerospace Ltd

W/O: 8518

WORK ORDER CHANGES

DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector
11.10.05	161	LOAD TUBE TO 3500 lb FOR 1 MINUTE. REF D.S. EMAIL.					
11.10.05	162	NDT TUBE.					

Part No: D350-748-101 PAR #: _____ Fault Category: _____ NCR: Yes No DQA: _____ Date: _____

Resolution: _____ Disposition: _____ QA: N/C Closed: _____ Date: _____

NCR:

WORK ORDER NON-CONFORMANCE (NCR)

DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

NOTE: Date & initial all entries

Chris Provencal

From: David Shepherd <dshepherd@dartaero.com>
Sent: Tuesday, April 27, 2010 3:40 PM
To: 'Mike Petsche'
Cc: 'Bill Beckett'; 'L Lacelle'; 'Chris Provencal'; 'Dan Stow'; ssheldon@dartaero.com
Subject: 350 crosstubes

Mike,

I discussed the 350 crosstube load testing with Bill a little while ago and this plan makes sense to him.

So, my recommendation to clear these crosstubes is to load the fwd crosstubes to 3500 lb and the aft crosstubes to 3000 lb in the deflection test rig and document on the work orders that this test has been completed. Hold max load for 1 minute. Per TP-D350-748-2, these loads represent the maximum load on these crosstubes at gross weight and are below the yield point of the material. I would like to request that Chris Provencal witness these tests and sign off the work orders based on his experience with Dart landing gears. My feeling is that if there is a problem with the parts, it will manifest itself during this load test. I, for one, would feel a lot more confident in testing each crosstube in this manner than relying totally on what Exova has to say. I think it would be very difficult to reach a conclusion on the whole batch on the basis of cracks in two parts from the batch.

I believe that we can accomplish this before next Friday, which also gives us time to hear what Exova has to say in case it has an impact on our decision. So far, what I have seen from Exova shows me that there are fluctuations in the heat treating but the tubes are heat treated to our specification.

For this reason, I believe we should tell DHS that it looks like we will be able to start shipping 350 crosstubes by May 7th pending a successful Engineering test of the material.

David.

Item ID: D350-748-101 **Accept** *N900040100* **Setup Start** *NS1*
Revision ID: U/R **Stop** *NS2*
Item Name: Crosstube Installation, High Fwd
Start Date: 15/03/2012 **Start Qty:** 1.00 *1*
Required Date: 04/04/2012 **Req'd Qty:** 1.00 *1*
Reference:
Cust Item ID:
Customer:

Approvals: **Process Plan:** **Date:** **Tooling:** **Date:** **Run Start** *NR1*
QC: **Date:** **SPC (Y/N):** **Date:** **Stop** *NR2*

Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
180		0.00							
180 SprayPaint	SprayPaint					AL 12-5-20			
	Memo	0.00							
Spray Painting	1-Prime inside crosstube as per QSI 005 4.2 B120133 start 6:30 Finish: 7:15 2-Prime Outside of Tube as per Dart QSI 005 4.2 B121625 start 11:15 Finish 12:00								
190	QC14- Inspect Spray Paint	0.00							
190 QC						12 05 22			
	Memo	0.00							
Quality Control	Then,Wrap in plastic bag to protect from scratches								
200		0.00							
200 Crosstubes	Crosstubes					12 · 05 · 22			
	Memo	0.00							
Crosstubes	1-Install Ground wire Insert,then insert screw and washer 2-Install Abraision strips as per Dwg D350-748-141 & QSI 035. 3-Install supports Using Dt8876 as per Dwg D350-748-141,Torque to 60-80 IN-LBS								

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W/O:		WORK ORDER CHANGES					
DATE	**STEP**	**PROCEDURE CHANGE**	**By**	**Date**	**Qty**	**Approval** Chief Eng / Prod Mgr	**Approval** QC Inspector

Part No: _____ **PAR #:** _____ **Fault Category:** _____ **NCR:** Yes No **DQA:** _____ **Date:** _____

Resolution: _____ **Disposition:** _____ **QA: N/C Closed:** _____ **Date:** _____

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	**STEP**	**Description of NC** Section A	**Corrective Action** Section B			**Verification** Section C	**Approval** Chief Eng	**Approval** QC Inspector
			Initial Chief Eng	**Action Description** Chief Eng	**Sign & Date**			

NOTE: Date & initial all entries

Item ID: D350-748-101
Revision ID: U/R
Item Name: Crosstube Installation, High Fwd
Start Date: 15/03/2012 **Start Qty:** 1.00 *1*
Required Date: 04/04/2012 **Req'd Qty:** 1.00 *1*
Reference:

Accept *N900040100*
Setup Start *NS1*
Stop *NS2*
Cust Item ID:
Customer:

Run Start *NR1*
Stop *NR2*

Approvals: **Process Plan:** **Date:** **Tooling:** **Date:**
QC: **Date:** **SPC (Y/N):** **Date:**

Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
210	QC5- Inspect part completeness to step on W/O	0.00							
210 QC Quality Control	**Memo**	0.00 5/16/23							
220	Pick Kit	0.00							
220 Packaging Packaging	**Memo**	0.00				1			12/05/23 JB
230	QC4- 100% Inspect kits for completeness	0.00							
230 QC Quality Control	**Memo**	0.00				1			12/05/23

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W/O:		WORK ORDER CHANGES					
DATE	**STEP**	**PROCEDURE CHANGE**	**By**	**Date**	**Qty**	**Approval** Chief Eng / Prod Mgr	**Approval** QC Inspector

Part No: _____ **PAR #:** _____ **Fault Category:** _____ **NCR:** Yes No **DQA:** _____ **Date:** _____

Resolution: _____ **Disposition:** _____ **QA: N/C Closed:** _____ **Date:** _____

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	**STEP**	**Description of NC** Section A	**Corrective Action** Section B			**Verification** Section C	**Approval** Chief Eng	**Approval** QC Inspector
			Initial Chief Eng	**Action Description** Chief Eng	**Sign & Date**			

NOTE: Date & initial all entries

Item ID: D350-748-101 **Accept** *N900040100* **Setup Start** *NS1*
Revision ID: U/R **Stop** *NS2*
Item Name: Crosstube Installation, High Fwd

Start Date: 15/03/2012 **Start Qty:** 1.00 *1* **Cust Item ID:**
Required Date: 04/04/2012 **Req'd Qty:** 1.00 *1* **Customer:**
Reference:

Run Start *NR1*
Stop *NR2*

Approvals: **Process Plan:** **Date:** **Tooling:** **Date:**
QC: **Date:** **SPC (Y/N):** **Date:**

Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
240		0.00							
240	Packaging								
Packaging	**Memo**	0.00							
Packaging	Identify and pack for shipping as per PPP D350-748-101 Location: PPP Rev: C								
250	QC21- Final Inspection - Work Order Release	0.00							
250									
QC	**Memo**	0.00							
Quality Control									

12/5/23 C
12/5/23
MF
12-05-23

Dart Aerospace Ltd

W/O:		WORK ORDER CHANGES					
DATE	**STEP**	**PROCEDURE CHANGE**	**By**	**Date**	**Qty**	**Approval** Chief Eng / Prod Mgr	**Approval** QC Inspector

Part No: _____ **PAR #:** _____ **Fault Category:** _____ **NCR:** Yes No **DQA:** _____ **Date:** _____

Resolution: _____ **Disposition:** _____ **QA: N/C Closed:** _____ **Date:** _____

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	**STEP**	**Description of NC** Section A	**Corrective Action** Section B			**Verification** Section C	**Approval** Chief Eng	**Approval** QC Inspector
			Initial Chief Eng	**Action Description** Chief Eng	**Sign & Date**			

NOTE: Date & initial all entries

Picklist Print

March-15-12 8:43:08 AM

5

Work Order ID: 81518

81518

Parent Item: D350-748-101

D350-748-101

Parent Item Name: Crosstube Installation, High Fwd

Start Date: 15/03/2012 **Required Date:** 04/04/2012

Start Qty: 1.00 **Required Qty:** 1.00

Comments:
IPP Rev:A New Issue 06-07-05 JLM
IPP Rev:B Update qty of MS21042L5 06-09-12 KJ
IPP Rev:C Rev B 07-11-15 DD
IPP Rev D Combined manufacturing 08.04.02 EC verified by: DD
IPP Rev:E 08-06-24 revD as per dwg DD verified by:EC IPP Rev:F
10.08.04 added QSI010 4.3 DD verf:EC

Component Item ID/ Item Name	Replacement Item ID	Mfg/ Purch	Bin Item	Primary Location	Last Location	Route Seq ID	Unit of Measure	Qty on Hand	Qty per Kit	Total Qty	Qty Issued	Date Issued	Status
D350-748-141TRN		Manufactured	No	B74674		110	Each	0.0000	1	1	JW	12-4-9	
D350-748-141TRN									**				
Crosstube Turning Detail													
ALS4-1032-225		Purchased	No			200	Each	1,102.000	1	1			
ALS4-1032-225									**			12.05.22	
Insert													

R# 121269

Location	Loc Qty	Loc Code
ST281	1019	
108696	146	
110768	62	
118386	55	
118966	68	
120671	688	
ST282	83	
120410	70	
120451	13	

AN960JD10	NAS1149D0363J	Purchased	No			200	Each	0.0000	1	1			
AN960JD10									**			12.05.22	
Washer													

R# 121243

Dart Aerospace Ltd

W/O:		WORK ORDER CHANGES					
DATE	**STEP**	**PROCEDURE CHANGE**	**By**	**Date**	**Qty**	**Approval** Chief Eng / Prod Mgr	**Approval** QC Inspector

Part No: _____ **PAR #:** _____ **Fault Category:** _____ **NCR:** Yes No **DQA:** _____ **Date:** _____

Resolution: _____ **Disposition:** _____ **QA: N/C Closed:** _____ **Date:** _____

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
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			Initial Chief Eng	**Action Description** Chief Eng	**Sign & Date**			

NOTE: Date & initial all entries

Picklist Print

March-15-12 8:43:08 AM

Work Order ID: 81518 *81518*

Parent Item: D350-748-101 *D350-748-101*

Parent Item Name: Crosstube Installation, High Fwd

Start Date: 15/03/2012 **Required Date:** 04/04/2012

Start Qty: 1.00 **Required Qty:** 1.00

D2856-400	Manufactured	No		200	f	199.5445	1.181	1.243158	
D2856-400							**		12·05·22

Abrasion Strip

Location	Loc Qty	Loc Code	
ST409	199.5445		
63735	0.6696		
68076	0.3149		
71164	8.46		
79551	190.1		

D3502-1	Manufactured	No		200	Each	39.0000	2	2	
D3502-1							**		12·05·22

Support

Location	Loc Qty	Loc Code	
ST051	39		
73419	19		
74873	20		

MS21920-20	Purchased	No		200	Each	60.0000	2	2	
MS21920-20							**		12·05·22

Clamp (per MIL-DTL-8783C)

BS# 121067

Location	Loc Qty	Loc Code	
LG050	60		
116799	8		
120475	2		
120676	50		

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W/O:		WORK ORDER CHANGES					
DATE	**STEP**	**PROCEDURE CHANGE**	**By**	**Date**	**Qty**	**Approval** Chief Eng / Prod Mgr	**Approval** QC Inspector

Part No: _____ **PAR #:** _____ **Fault Category:** _____ **NCR:** Yes No **DQA:** _____ **Date:** _____

Resolution: _____ **Disposition:** _____ **QA: N/C Closed:** _____ **Date:** _____

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
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			Initial Chief Eng	**Action Description** Chief Eng	**Sign & Date**			

NOTE: Date & initial all entries

Picklist Print

March-15-12 8:43:08 AM

Work Order ID: 81518 *81518*

Parent Item: D350-748-101 *D350-748-101*

Parent Item Name: Crosstube Installation, High Fwd

Start Date: 15/03/2012 **Required Date:** 04/04/2012

Start Qty: 1.00 **Required Qty:** 1.00

MS27039-1-10	Purchased	No		200	Each	258.0000	1	1

MS27039-1-10

Screw

** 12·05·22

Location	Loc Qty	Loc Code	
GA	100		
120449	100		
ST291	158		
120120	158		

AN4-41A	Purchased	No		220	Each	387.0000	8	8 ✓

AN4-41A

Bolt

** JB

Location	Loc Qty	Loc Code	
ST360	387		
115108	3		
115705	7		
117619	27		
118451	50		118451
118838	50		
119328	100		
120423	150		

AN4-6A	Purchased	No		220	Each	1,649.000	16	16 ✓

AN4-6A

Bolt

** 121631 JB 12/05/23

Location	Loc Qty	Loc Code	
ST356	1649		
119017	1649		

Dart Aerospace Ltd

W/O:		WORK ORDER CHANGES					
DATE	**STEP**	**PROCEDURE CHANGE**	**By**	**Date**	**Qty**	**Approval** Chief Eng / Prod Mgr	**Approval** QC Inspector

Part No: _____ **PAR #:** _____ **Fault Category:** _____ **NCR:** Yes No **DQA:** _____ **Date:** _____

Resolution: _____ **Disposition:** _____ **QA: N/C Closed:** _____ **Date:** _____

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	**STEP**	**Description of NC** Section A	**Corrective Action** Section B			**Verification** Section C	**Approval** Chief Eng	**Approval** QC Inspector
			Initial Chief Eng	**Action Description** Chief Eng	**Sign & Date**			

NOTE: Date & initial all entries

Picklist Print

March-15-12 8:43:08 AM

Work Order ID: 81518 *81518*

Parent Item: D350-748-101 *D350-748-101*

Parent Item Name: Crosstube Installation, High Fwd

Start Date: 15/03/2012 **Required Date:** 04/04/2012

Start Qty: 1.00 **Required Qty:** 1.00

AN5-32A	Purchased	No		220	Each	256.0000	4	4	✓
AN5-32A						**			JB
Bolt									

Location	Loc Qty	Loc Code
ST339	256	
119328	100	
119862	50	
120423	75	
120717	1	
120910	30	120910

AN960JD416	~~NAS1149D0463J~~	Purchased	No		220	Each	14.0000	32	32 ✓
AN960JD416							**		121255 JB
Washer									

Location	Loc Qty	Loc Code
ST351	14	
116289	14	

AN960JD516	NAS1149D0563J	Purchased	No		220	Each	0.0000	8	8 ✓
AN960JD516							**		119546 JB
Washer									
D3500-1		Manufactured	No		220	Each	35.0000	4	4 ✓
D3500-1							**		JB 12/05/23
Saddle									

Location	Loc Qty	Loc Code
ST424	35	
73406	8	
76000	27	76000

Dart Aerospace Ltd

W/O:		WORK ORDER CHANGES					
DATE	**STEP**	**PROCEDURE CHANGE**	**By**	**Date**	**Qty**	**Approval** Chief Eng / Prod Mgr	**Approval** QC Inspector

Part No: _____ **PAR #:** _____ **Fault Category:** _____ **NCR:** Yes No **DQA:** _____ **Date:** _____

Resolution: _____ **Disposition:** _____ **QA: N/C Closed:** _____ **Date:** _____

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	**STEP**	**Description of NC** Section A	**Corrective Action** Section B			**Verification** Section C	**Approval** Chief Eng	**Approval** QC Inspector
			Initial Chief Eng	**Action Description** Chief Eng	**Sign & Date**			

NOTE: Date & initial all entries

Picklist Print

March-15-12 8:43:08 AM

Work Order ID: 81518 *81518*

Parent Item: D350-748-101 *D350-748-101*

Parent Item Name: Crosstube Installation, High Fwd

Start Date: 15/03/2012 **Required Date:** 04/04/2012

Start Qty: 1.00 **Required Qty:** 1.00

D3501-1	Manufactured	No		220	Each	361.0000	16	16 ✓

D3501-1

Bushing

** 14x 81955 JB

Location	Loc Qty	Loc Code	
ST051	361		
67757	4		
70682	83		2x 70682
73391	6		
74866	207		
77033	61		

MS21042L4	Purchased	No		220	Each	5,585.000	24	24 ✓

MS21042L4

Nut

** JB

Location	Loc Qty	Loc Code	
ST300	5585		
117441	51		
117601	157		
117885	16		
118451	133		
119017	232		
119075	2996		
121011	2000		1210 M

MS21042L5	Purchased	No		220	Each	1,602.000	4	4 ✓

MS21042L5

Nut

** JB 12/05/23

Location	Loc Qty	Loc Code	
ST300	1602		
116105	5		
116548	43		
117611	42		
118179	12		
119109	1500		119109

Dart Aerospace Ltd

W/O:		WORK ORDER CHANGES					
DATE	**STEP**	**PROCEDURE CHANGE**	**By**	**Date**	**Qty**	**Approval** Chief Eng / Prod Mgr	**Approval** QC Inspecter

Part No: _____ **PAR #:** _____ **Fault Category:** _____ **NCR:** Yes No **DQA:** _____ **Date:** _____

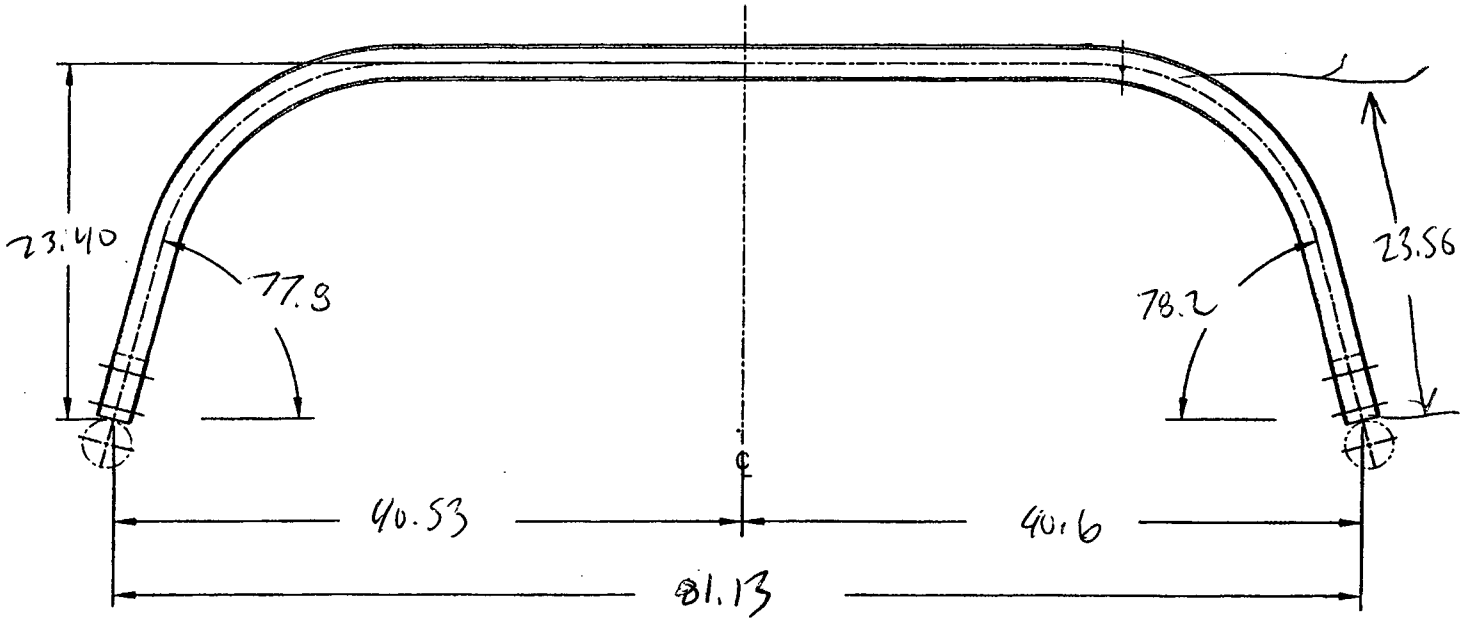
Resolution: _____ **Disposition:** _____ **QA: N/C Closed:** _____ **Date:** _____

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	**STEP**	**Description of NC** Section A	**Corrective Action** Section B			**Verification** Section C	**Approval** Chief Eng	**Approval** QC Inspector
			Initial Chief Eng	**Action Description** Chief Eng	**Sign & Date**			

NOTE: Date & initial all entries

DART AEROSPACE LTD	Work Order:	81518
Description: Crosstube High Fwd (AS350/355)	Part Number:	D350-748-101
Inspection Dwg: D350-748-141 **Rev:** F		Page 1 of 1

Required Dimension	Min	Max
Height	23.13	23.37
1/2 Span	40.78	41.02
Angle	75	77
Total Span	81.56	82.04



Comments
Twist 0.249
CRUSHING 6.3% / 5.8%

QC15 Inspection	
Date	17.04.11

Rev	Date	Change	Revised by	Approved
A	07.02.06	New Issue	KJ/JM	
B	10.08.23	Dwg Rev updated	KJ	
C	11.11.07	Dwg Rev updated	KJ	

2.048
2.323

2.063
2.318

Dart Aerospace Ltd

W/O:		WORK ORDER CHANGES					
DATE	**STEP**	**PROCEDURE CHANGE**	**By**	**Date**	**Qty**	**Approval** Chief Eng / Prod Mgr	**Approval** QC Inspector

Part No: _____ **PAR #:** _____ **Fault Category:** _____ **NCR:** Yes No **DQA:** _____ **Date:** _____

Resolution: _____ **Disposition:** _____ **QA: N/C Closed:** _____ **Date:** _____

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	**STEP**	**Description of NC** Section A	**Corrective Action** Section B			**Verification** Section C	**Approval** Chief Eng	**Approval** QC Inspector
			Initial Chief Eng	**Action Description** Chief Eng	**Sign & Date**			

NOTE: Date & initial all entries

Item	Qty -141	Part Number	Description
1	X	D350-748-141	CROSSTUBE ASSEMBLY (AS 350/355 HI FWD)
2	1	D6015-125	CROSSTUBE (OR D6017-115)
3	2	D3502-1	SUPPORT
4	2	D2856-400-710	ABRASION STRIP
5	1	AELS-1032-225	INSERT
6	1	NAS1149D0363J	WASHER (OR AN960JD10)
7	2	MS21920-20	CLAMP (PER DART SPEC. M-MS21920-20)
8	1	MS27039-1-10	SCREW

SHOP COPY
RETURN TO
ENGINEERING
UNCONTROLLED COPY
SUBJECT TO AMENDMENT
WITHOUT NOTICE
WORK ORDER
NO. 81518 MC
12/03/15

UNDER REVIEW
11.07.12

RELEASED
2011-01-18

GENERAL NOTES:

1) MATERIAL: MANUFACTURED FROM D6015-125 OR D6017-115
   FINISHED LENGTH = 110.270±0.06
2) FINISH: MAGNETIC PARTICLE INSPECT PER DART QSI 038 4.2
   CADMIUM PLATE PER AMS-QQ-P-416B, CLASS 1, TYPE II
   PRIME INSIDE AND OUTSIDE PER DART QSI 005 4.2
   PAINT OUTSIDE PER DART QSI 005 4.2
3) TOLERANCES ARE PER DART QSI 018 UNLESS OTHERWISE NOTED.
4) UNITS: INCHES UNLESS OTHERWISE NOTED.
5) BREAK SHARP EDGES: 0.005 TO 0.010 MAX.
6) IDENTIFICATION: DART PART NUMBER "D350-748-141" AND BATCH NUMBER ON INSIDE OF CUFF PER DART QSI 044 6.4 (VIBRATING STYLUS)
7) WEIGHT: 30.45 lbs
8) PART IS SYMMETRIC ABOUT CENTERLINE, EXCEPT FOR Ø0.297 HOLE.
9) BLEND OUT ALL EDGES FROM MACHINING LONGITUDINALY, TRANSITION SHOULD BE SMOOTH. NOTE: ALL HOLES ARE DRILLED AFTER BENDING.
10) BEND PROGRESSIVELY WITH A MINIMUM OF 7 PASSES. MAXIMUM TUBE FLATTENING DUE TO BENDING IS 6% BASED ON O.D.
11) HEAT TREAT TO MIN. 180 KSI PER MIL-T-6736 OR AMS 2759-1C AFTER TURNING. ACCEPTABLE TO VERIFY TENSILE STRENGTH BY HARDNESS TEST PER ASTM E18 TO 40-45 HRC.
12) INSTALL D2856-400-710 ABRASION STRIPS WITH A GAP ON BOTTOM SIDE OF CROSSTUBE, CENTERED OPPOSITE D3502-1 SUPPORT, PER QSI 035.
13) EXTREME CARE MUST BE TAKEN TO PROTECT THE OUTSIDE SURFACE OF THE TUBE. THE OUTSIDE SURFACE MUST BE SMOOTH AND FREE FROM SURFACE DEFECTS SUCH AS SCRATCHES, NICKS, OR DENTS. DEFECTS UP TO 0.005" MAY BE BLENDED OUT LONGITUDINALLY. CIRCUMFERENTIAL GRIND MARKS ARE UNACCEPTABLE. WHEN DRILLING HOLES EXTREME CARE MUST BE TAKEN AND CAREFUL DEBURRING PERFORMED TO ENSURE A CLEAN HOLE WITH NO CRACKING/CHIPPING/GROOVES.
14) TORQUE CLAMPS 60 TO 80 IN-LB. ENSURE AT LEAST 1.5 THREADS SHOWING IN SAFETY AND THAT NUT HAS NOT BOTTOMED-OUT AFTER TORQUING.
15) MAX TWIST AFTER BENDING: WITH XTUBE LAYED FLAT ON SURFACE, THE DIFFERENCE BETWEEN CUFF HEIGHTS FROM THE SURFACE MAY BE NO LARGER THAN 0.25 (ZN C1-3).

REV.	DESCRIPTION	BY	DATE
F	ADD HRC TEST OPTION (B8-1) PER PAR 09-040, ADD TWIST LIMIT (A8-1, C1-3), ADD D6015-125 OPTION (C8-1), STOCK DIM NOW MACHINED (D1-4)	CP	10.11.23
E	REVISE GENERAL NOTES; UPDATE TO CURRENT ADD STANDARDS; RELOCATED FLAG #6 PER PAR 08-046 (ZN A6-3); TOLERANCES (ZN C6-3, D1-3)	RF	09.09.30
D	MAG. PARTICLE AND CAD PLATE AS MFD.	CP	06.10.31
C	ADD CAD PLATING	CP	06.08.14
B	ADD D6017-115 & PRIME AND PAINT	CP	06.06.30
A	NEW ISSUE	CP	06.03.31

DESIGN		DART AEROSPACE LTD HAWKESBURY, ONTARIO, CANADA
DRAWN		
CHECKED		DRAWING NO. REV. F
MFG. APPR.		D350-748-141 SHEET 1 OF 4
APPROVED		TITLE SCALE
DE APPR.		CROSSTUBE (AS 350/355 HI FWD) NTS
DATE	10.11.23	

Dart Aerospace Ltd

W/O:		WORK ORDER CHANGES					
DATE	**STEP**	**PROCEDURE CHANGE**	**By**	**Date**	**Qty**	**Approval** Chief Eng / Prod Mgr	**Approval** QC Inspector

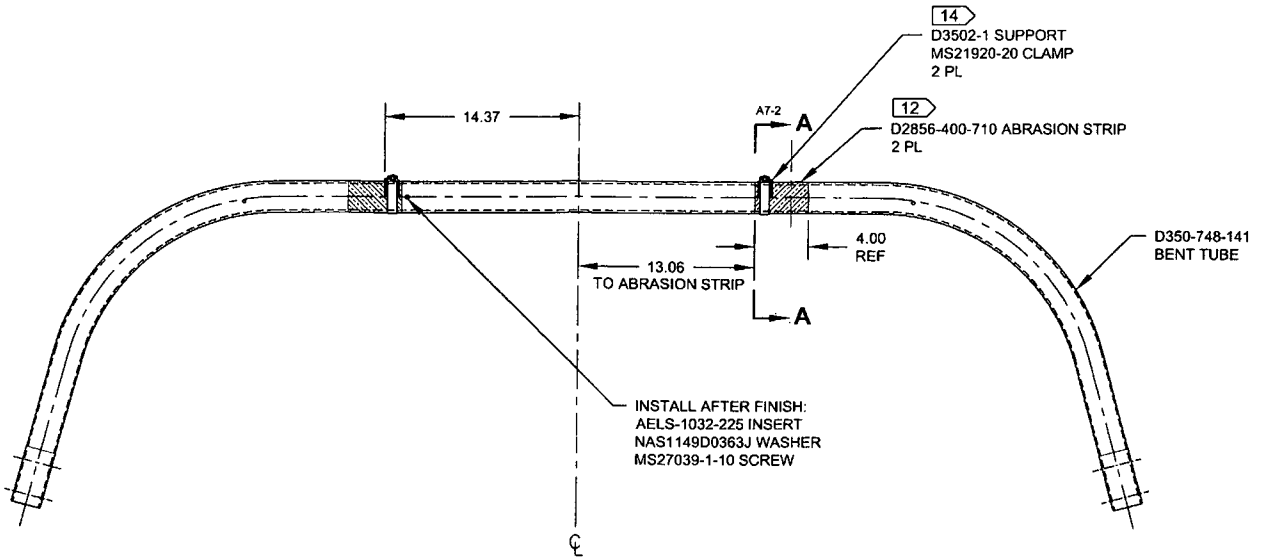
Part No: _____ **PAR #:** _____ **Fault Category:** _____ **NCR:** Yes No **DQA:** _____ **Date:** _____

Resolution: _____ **Disposition:** _____ **QA: N/C Closed:** _____ **Date:** _____

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	**STEP**	**Description of NC** Section A	**Corrective Action** Section B			**Verification** Section C	**Approval** Chief Eng	**Approval** QC Inspector
			Initial Chief Eng	**Action Description** Chief Eng	**Sign & Date**			

NOTE: Date & initial all entries

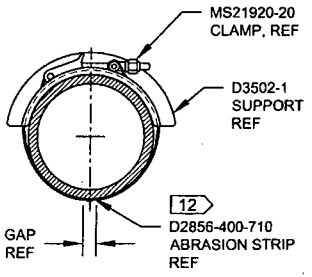
81518



D350-748-141
ASSEMBLY DETAIL

UNDER REVIEW
11.07.11

RELEASED
2011 -01- 18



SECTION A-A D4-2
SCALE 4X

DESIGN		**DART AEROSPACE LTD**	
DRAWN		HAWKESBURY, ONTARIO, CANADA	
CHECKED		DRAWING NO.	REV. F
MFG. APPR.		D350-748-141	SHEET 2 OF 4
APPROVED		TITLE	SCALE
DE APPR.		CROSSTUBE (AS 350/355 HI FWD)	NTS
DATE 10.11.23			

Dart Aerospace Ltd

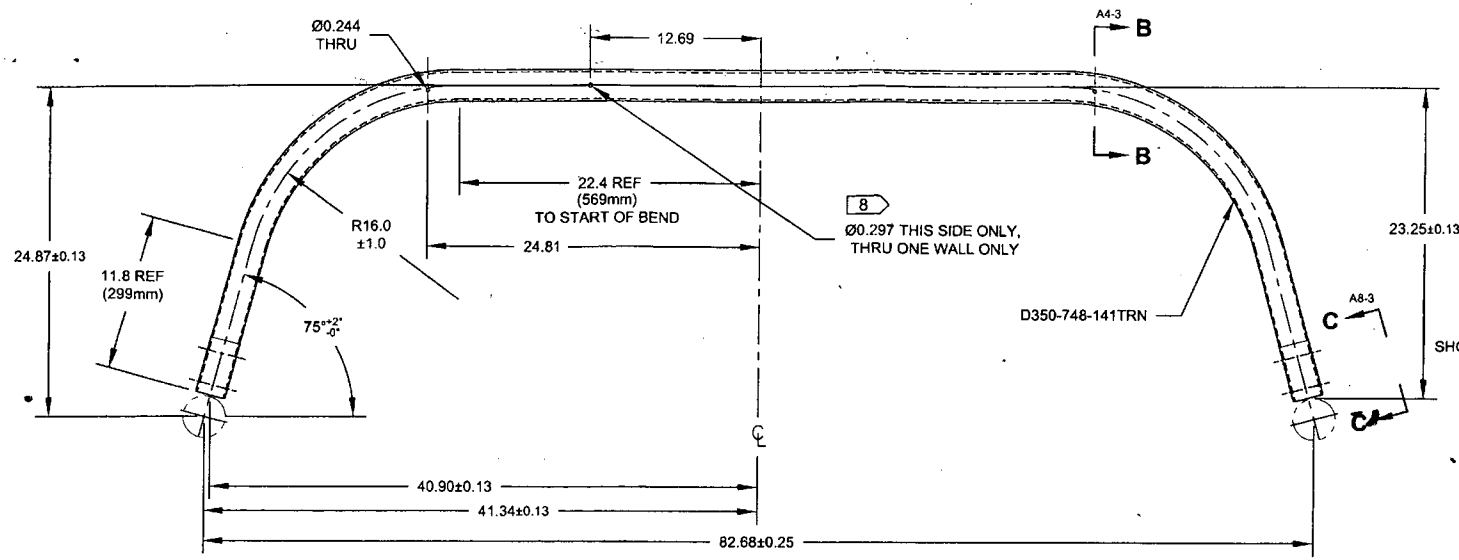
W/O:		WORK ORDER CHANGES					
DATE	**STEP**	**PROCEDURE CHANGE**	**By**	**Date**	**Qty**	**Approval** Chief Eng / Prod Mgr	**Approval** QC Inspector

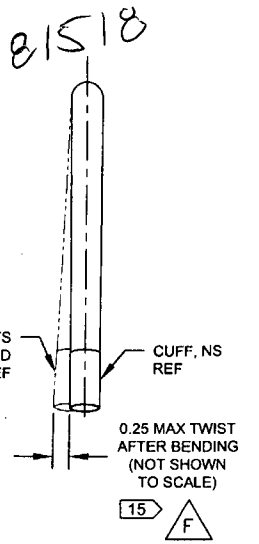
Part No: _____ **PAR #:** _____ **Fault Category:** _____ **NCR:** Yes No **DQA:** _____ **Date:** _____

Resolution: _____ **Disposition:** _____ **QA: N/C Closed:** _____ **Date:** _____

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	**STEP**	**Description of NC** Section A	**Corrective Action** Section B			**Verification** Section C	**Approval** Chief Eng	**Approval** QC Inspector
			Initial Chief Eng	**Action Description** Chief Eng	**Sign & Date**			

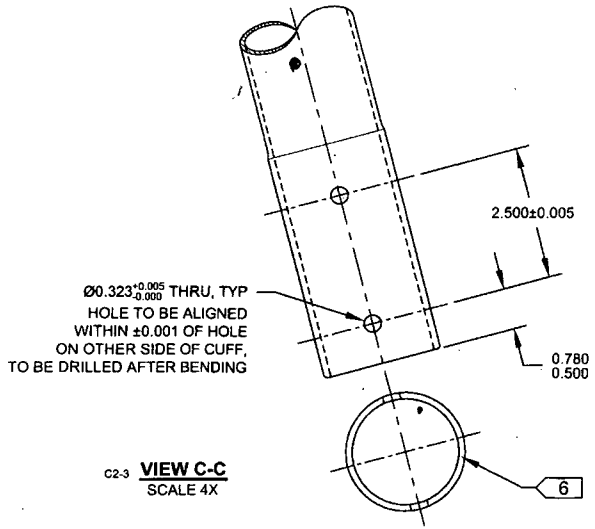
NOTE: Date & initial all entries



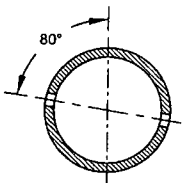


8/15/18

D350-748-141
BENDING AND DRILLING DETAIL 10



C2-3 **VIEW C-C**
SCALE 4X



SECTION B-B D3-3
SCALE 4X

UNDER REVIEW
11.27.17

RELEASED
2011-01-18

DESIGN		DART AEROSPACE LTD	
DRAWN		HAWKESBURY, ONTARIO, CANADA	
CHECKED		DRAWING NO.	REV. F
MFG. APPR.		D350-748-141	SHEET 3 OF 4
APPROVED		TITLE	SCALE
DE APPR.		CROSSTUBE (AS 350/355 HI FWD)	NTS
DATE	10.11.23		

Dart Aerospace Ltd

W/O:		WORK ORDER CHANGES					
DATE	**STEP**	**PROCEDURE CHANGE**	**By**	**Date**	**Qty**	**Approval** Chief Eng / Prod Mgr	**Approval** QC Inspector

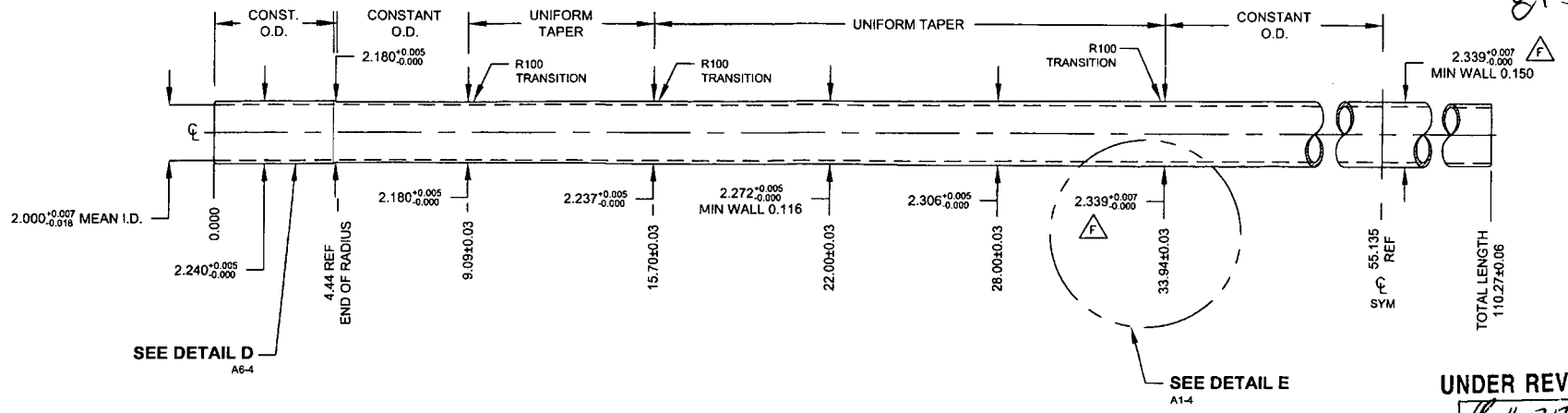
Part No: _____ **PAR #:** _____ **Fault Category:** _____ **NCR:** Yes No **DQA:** _____ **Date:** _____

Resolution: _____ **Disposition:** _____ **QA: N/C Closed:** _____ **Date:** _____

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	**STEP**	**Description of NC** Section A	**Corrective Action** Section B			**Verification** Section C	**Approval** Chief Eng	**Approval** QC Inspector
			Initial Chief Eng	**Action Description** Chief Eng	**Sign & Date**			

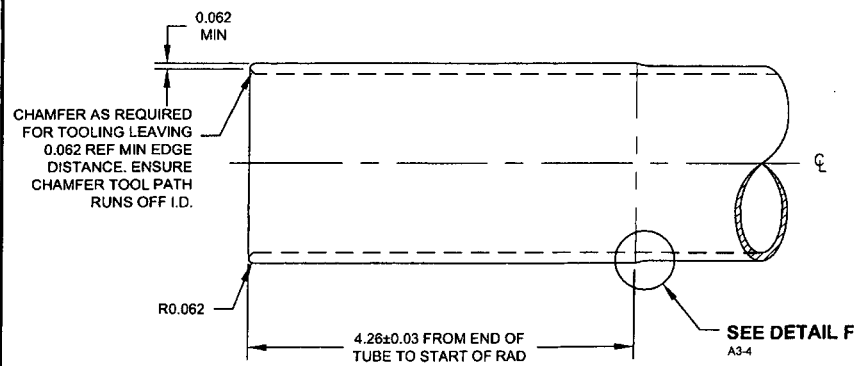
NOTE: Date & initial all entries

8158

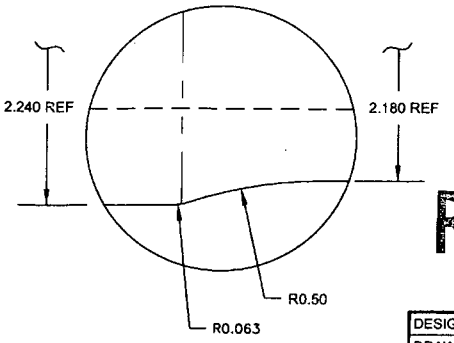


UNDER REVIEW
11.07.12

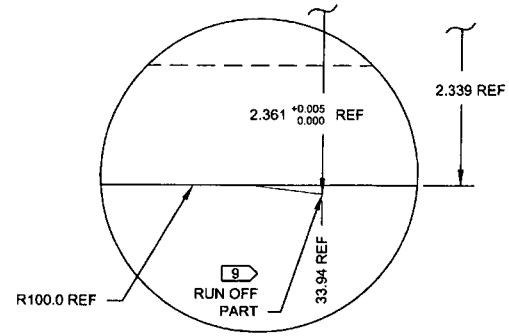
D350-748-141TRN TURNING DETAIL



DETAIL D: CROSSTUBE CUFF C7-4
SCALE 3X



DETAIL F: CUFF TRANSITION A5-4
NOT TO SCALE



RELEASED
2011 -01- 18

DETAIL E: TAPER RUN-OFF C3-4
NOT TO SCALE

DESIGN		**DART AEROSPACE LTD** HAWKESBURY, ONTARIO, CANADA	
DRAWN			
CHECKED		DRAWING NO. D350-748-141	REV. F SHEET 4 OF 4
MFG. APPR.			
APPROVED		TITLE CROSSTUBE (AS 350/355 HI FWD)	SCALE NTS
DE APPR.			
DATE 10.11.23			

Dart Aerospace Ltd

W/O:		WORK ORDER CHANGES					
DATE	**STEP**	**PROCEDURE CHANGE**	**By**	**Date**	**Qty**	**Approval** Chief Eng / Prod Mgr	**Approval** QC Inspector

Part No: _____ **PAR #:** _____ **Fault Category:** _____ **NCR:** Yes No **DQA:** _____ **Date:** _____

Resolution: _____ **Disposition:** _____ **QA: N/C Closed:** _____ **Date:** _____

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	**STEP**	**Description of NC** Section A	**Corrective Action** Section B			**Verification** Section C	**Approval** Chief Eng	**Approval** QC Inspector
			Initial Chief Eng	**Action Description** Chief Eng	**Sign & Date**			

NOTE: Date & initial all entries

DRAWING NO.	TITLE	REV. F	DART AEROSPACE LTD ENGINEERING ORDER	D.E.O. NO.	SHEET NO.	SCALE
D350-748-141	CROSSTUBE (AS 350/355 HI FWD)			D350-748-141-F-1	SHEET 1 OF 1	NTS

DRAWN	CHECKED	MFG. APPR.	APPROVED	DE APPR.
DATE 12.04.02	DATE 12.04.03	DATE 12.04.03	DATE 12.04.03	DATE 12.04.03

PURPOSE:
ADD A STRESS RELIEF OPERATION FOLLOWING BENDING

CHANGE:

ADD

10) AFTER BENDING: STRESS RELIEF AT 650°F ± 25°F FOR A MINIMUM OF 2 HRS.
AIR COOL TO AMBIENT TEMPERATURE
(REF. AMS2759/1E)

METCOR INC.

560 BOUL. ARTHUR-SAUVÉ
ST-EUSTACHE, QC, J7R 5A8
Tel: 450-473-1884 / Fax: 450-491-5498

Certificat de Conformité Détaillé
Detailed Certificate of Compliance

BON DE TRAVAIL order	CHARGEMENT load
175005	1

CLIENT / customer 215
DART AEROSPACE
1270 ABERDEEN
HAWKESBURY ON K6A 1K7

LIVRÉ À / shipped to: 1
DART AEROSPACE
1270 ABERDEEN
HAWKESBURY ON K6A 1K7

COMMANDE DU CLIENT customer po	BON DE LIVRAISON DU CLIENT customer shipper no.	MATÉRIEL material	CODE DE TRAITEMENT mat'l heat code	NUMÉRO DE LOT lot number
PO16638		Steel		

SPÉCIFICATIONS DU PROCÉDÉ
processing specifications

STRESS REL

SAE AMS 2759/1 REV.E

EXIGENCE / requirement	SPÉCIFICATIONS / specified	TESTS EXÉCUTÉS / performed	RÉSULTATS DE TESTS / results
Visual			

QUANTITÉ quantity	POIDS weight	DESCRIPTION DES PIÈCES parts description
9	270	D350-748-101 (7) CROSS TUBE (2) D350-748-201 CROSS TUBE CONTENANT: 1 NIL

Operation	Temp. spécifiée Specified Temp	Temps de trempe Spécifié Specified Soak Temp	Atmosphere	Carbone Carbon Potential	Q-Media Q-Temp	Four # Furnace #	Date Départ Start Date	Heure d'entrée Time In	Heure de sortie Time Out	Date Complétée Date complete
1,00 CONT. INIT.	LAVAGE		si nécessaire							
2,00 PREPARINC	COMPTAGE									
3,00 STRESS RE	650 +/-25°F	2 hrs	air			701				
4,00 FINAL INSP							04-05-2012			04-05-2012

COMMENTAIRES / comments

ALL THE HEAT TREATMENT PROCESSING PERFORMED ON THIS ORDER WAS ACCOMPLISHED USING HEAT TREATMENT EQUIPEMENT THAT MEETS THE REQUIREMENTS OF AMS 2759. ALL THE HEAT TREATMENT OPERATIONS WERE ACCOMPLISHED IN ACCORDANCE WITH THE REQUESTED/REQUIRED HEAT TREATMENT SPECIFICATION AND ALL REQUIRED VERIFICATIONS TEST HAVE BEEN PERFORMED AND DOCUMENTED. NO UNAUTHORIZED CHANGES OR DEVIATIONS TO REQUIRED HEAT TREATMENT SPECIFICATIONS OR PROCEDURES HAVE BEEN PERFORMED.

METCOR INC.
560 BOUL. ARTHUR-SAUVÉ
ST-EUSTACHE, QC, J7R 5A8
Tel: 450-473-1884 / Fax: 450-491-5498

Certificat de Conformité Détaillé
Detailed Certificate of Compliance

BON DE TRAVAIL order	CHARGEMENT load
175005	1

CLIENT / customer: 215
DART AEROSPACE
1270 ABERDEEN
HAWKESBURY ON K6A 1K7

LIVRÉ À / shipped to: 1
DART AEROSPACE
1270 ABERDEEN
HAWKESBURY ON K6A 1K7

APPROUVÉ par / Approved by: Steve Lalonde MET 16 DATE: 2012-04-05

/ Nous certifions que toute l'information comprise sur ce rapport est exacte et conforme aux requis du client./We certify that all the information on this report is exact and in accordance with the order requirements.

Metcor Inc.

Metcor Inc.
560, boul. Arthur-Sauvé
St-Eustache (Québec) J7R 5A8
Tél. 450 473-1884
Télécopieur/Fax administration : 450 491-5498
Télécopieur/Fax production : 450 491-6454

Certificat de conformité
Certificate

BON DE TRAVAIL order	CHARGEMENT load
175005	1

CLIENT / customer
DART AEROSPACE
1270 ABERDEEN
HAWKESBURY ON K6A 1K7

LIVRÉ À / shipped to:
DART AEROSPACE
1270 ABERDEEN
HAWKESBURY ON K6A 1K7

BON DE COMMANDE DU CLIENT customer po	BON DE LIVRAISON DU CLIENT customer shipper no.	MATÉRIEL material	CODE DE TRAITEMENT matl heat code	NUMÉRO DE LOT lot number
		Steel		

SPÉCIFICATIONS DU PROCÉDÉ
processing specifications

STRESS REL

SAE AMS 2759/1 REV.E

EXIGENCE / requirement	SPÉCIFICATIONS / specified	TESTS EXÉCUTÉS / performed	RÉSULTATS DE TESTS / results
Visual			

QUANTITÉ quantity	POIDS weight	DESCRIPTION DES PIÈCES parts description
3	270	D360-748-141-F-1

COMMENTAIRES / comments

INSPECTEUR / inspector: METCOR 7 DATE: 2012-04-05

Dora Cameron

From: Dan Stow <dstow@dartaero.com>
Sent: April 18, 2012 4:42 PM
To: Dora Cameron
Subject: FW: 350 crosstubes oval cuffs

DART AEROSPACE

Dan Stow
Special Projects Manager
T. 613-632-5200 | C. 613-676-3320 | F. 613-632-1426
1270 Aberdeen Street, Hawkesbury, Ontario, Canada, K6A 2K7

From: David Shepherd [mailto:dshepherd@dartaero.com]
Sent: Wednesday, April 18, 2012 12:10 PM
To: 'Bill Beckett'
Cc: 'Dan Stow'; 'L Lacelle'; 'Mike Petsche'; 'Eric Downing'; 'Pat Smith'
Subject: RE: 350 crosstubes oval cuffs

Agreed ... This seems OK to me ... Hopefully we only need to do this to a handful of crosstubes.

David

From: Bill Beckett [mailto:bbeckett@dartaero.com]
Sent: April-18-12 6:31 AM
To: 'David Shepherd'
Cc: 'Dan Stow'; 'L Lacelle'; 'Mike Petsche'; 'Eric Downing'; Pat Smith
Subject: RE: 350 crosstubes oval cuffs

David,
This looks like a relatively controllable process that we could have Dan carry out on the other crosstubes that are oval in the cuff area.
If you agree with this rework method, we will proceed with the remainder of the crosstubes. I suggest we do this via markup on the specific work orders.
Bill

From: Dan Stow [mailto:dstow@dartaero.com]
Sent: April 18, 2012 7:52 AM
To: Bill Beckett; David Shepherd; 'Mike Petsche'; L Lacelle; Eric Downing
Subject: 350 crosstubes oval cuffs

Hello All,

Please reference photo attached. The crosstube was placed in a hydraulic press between two sheets of plywood to prevent damage with the max. dimension facing up and down. 9000 lbs (5000psi at 1.5" bore) was applied and then crosstube was removed from the press and measured. Process was repeated with the crosstube at a different position because the max. dimension had changed location. Total time for rework was approximately 20 mins.

Cuff dimension before rework was min. 2.200" max. 2.280"

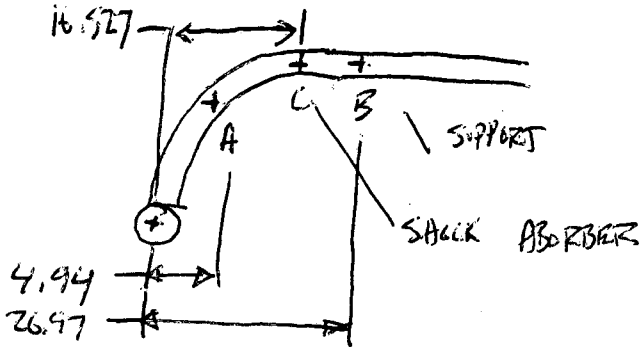
Cuff dimension after rework is min.2.230" max. 2.252" which is 0.010" below tolerance and 0.007" above tolerance but now fits in the drill jig.

DART AEROSPACE

Dan Stow
Special Projects Manager
T. 613-632-5200 | C. 613-676-3320 | F. 613-632-1426
1270 Aberdeen Street, Hawkesbury, Ontario, Canada, K6A 2K7

12.04.19

CRUSHING OF D350-748-101



POINT A $OD_1 = 2.400$ $OD_2 = 2.044$

$CRUSHING = (2.400 - 2.044)/(2.400 + 2.044) = 8\%$

$I = 0.361\ in^4$ (AutoCAD)

POINT B $OD = 2.339$ $ID = 2.000$

~~CRUSHING~~ $I = 0.684\ in^4$

At A: $F = Mc/I = P \times 4.94 \times 2.044/2 \times 0.361 = 13.98\ P$

At B: $= P \times 26.97 \times 2.339/2 \times 0.684 = 46.11 \times P$

$M.S. = 46.11/13.98 - 1 = 2.30$

∴ Tube will fail at support before tube fails at area of max crushing. ∴ 8% CRUSHING IS Acceptable.

POINT C $I = 0.684\ in^4$

$F = Mc/I \Rightarrow$ ~~$P \times 16.527 \times 2.339/2 \times 0.684$~~ $P \times 16.527 \times 2.339/2 \times 0.684 = 28.26 \cdot P$

$MS = 28.26/13.98 - 1 = 1.02$

∴ Tube will fail at shock absorber before area of max crushing ∴ 8% crushing is acceptable

12.04.19

CERTIFICATE OF CONFORMANCE

CADORATH PLATING CO. LTD.
2150 LOGAN AVENUE
WINNIPEG, MANITOBA R2J-0J1

DATE: May-08-2012

CONSIGNED TO: Dart Aerospace Ltd.
1270 Aberdeen St.
Hawksbury, ON K6A 1K7

W/O #: 114045
INVOICE #: 60317

CONTRACT OR
PURCHASE ORDER # PO16826

DESCRIPTION: SKID

QTY 1

P/N # d350-748-101

S/N # 81518

CADMIUM PLATE IAW AMS-QQ-P-416C TYPE 2 YELLOW CLASS 2.
MPI IAW ASTM-E-1444. BAKE HEAT CHART # 12-425 AND # 12-447.

CERTIFICATE: I certify that the items indicated here on have been inspected and tested and conform to all specifications and requirements detailed on the contract or purchase order.

CI 22

Approved Inspector:

ACUREN

RAPPORT D'ESSAI NON DESTRUCTIF

(SUITE)

RAPPORT # P-11201-...

CLIENT Bombardier Aerospace — DATE May 17, 2012 HEURE ☐ AM ☐ PM

ATTENTION — NO. TRAVAIL ACUREN IRE-12-2012

RÉSULTATS (☐ METRIQUE ☐ IMPÉRIAL)

Crosstubes

①	work order	ID	83060	Item ID	D350-748-101				Inspection OK
	"	"	77766	"	"	"	"	"	OK
	"	"	76574	"	"	"	"	"	OK
	"	"	81518	"	"	"	"	"	OK
	"	"	76573	"	"	"	"	"	OK
	"	"	77763	"	"	"	"	"	OK
	"	"	73807	"	"	"	"	201	OK
	"	"	81523	"	"	"	"	201	OK

② # on crosstube B83060

No paper work Fit with this number

Inspection OK

2 x-tubes under batch # 83060

→ Preliminary Design

Étendue des Services

L'entente selon laquelle le Groupe Acuren Inc. exécute les service descriptions, les observations et les expressions d'opinions faites pa pas des déclarations ou des garanties ou ne peuvent être interpré entière des décisions prises en matière d'ingénierie, de fabrication, services rendus.

Norme de Diligence

Dans l'exécution des services, le Groupe Acuren Inc. applique le d localité ou dans une localité similaire. Aucune autre garantie, impli

dent au-delà de l'exécution des services demandés. Il est entendu que toutes les on et les hypothèses fournies par le propriétaire/opérateur, et elles ne constituent a propriétaire/opérateur, et le propriétaire/opérateur conserve la responsabilité rapport avec les services décrits dans les présentes ne peuvent excéder le coût des

emblables par d'autres fournisseurs de ce type de services opérant dans la même

SIGNATURES

REPRÉSENTANT À LA CLIENTÈLE: Ian Tinley (MOULÉE) — (SIGNATURE)

TECHNICIEN (SIGNATURE)

NAME (MOULÉE): Pierre-Luc Dufour (1er TECHNICIEN)

NIVEAU CGSB 2 NIVEAU SNT 2

NO. ENREG. CGSB 12205

2e TECHNICIEN

NIVEAU CGSB ____ NIVEAU SNT ____

NO. ENREG. CGSB ____

FTJ #: ____

RAPPORT REVISÉ PAR: ____ (NOM) (INITIALES)

H-3050

BLANCHE – COPIE DU CLIENT JAUNE – COPIE DU BUREAU ROSE – COPIE DU TECHNICIEN OR – COPIE DU BUREAU

ACUREN

RAPPORT D'INSPECTION PAR RESSUAGE

P - 11201

PAGE 1 DE 2

CLIENT	Dart Aerospace	DATE	May 17th 2012 HEURE AM ☐ PM ☑
ATTENTION	Mme. Chantal	Nº TRAVAIL ACUREN	188-12-2012
ADRESSE	1270 Aberdeen St	Nº CLIENT PO/WO	30551
	Hawkesbury, Ont	SITE DE TRAVAIL	Hawkesbury
		ACCEPTATION STD.	ASTM E 1417-05 / [illegible] DATE/RÉV. 2005
PROJET	Inspection Fluorescent on crosstubes external surface		
ITEM(S) EXAMINÉ	9 Crosstubes		

DESCRIPTION DES TRAVAUX Nº PROCÉDURE LT-002 DATE/RÉV. 2009 Nº TECHNIQUE LT-002 DATE/RÉV. 2009

Nº ITEMS 9 Crosstubes see below MATÉRIEL Steel ÉPAISSEUR —

DESCRIPTION Fluorescent inspection, 100% on external surface on 9 Crosstubes

DÉTAILS DES INSPECTIONS

MÉTHODE : ☑ FLUORESCENT ☐ VISIBLE		☑ LAVABLE À L'EAU ☐ MÉTHODE DISSOLVANT ☐ PRÉ-ÉMULSIONNANT	
MARQUE : Magnaflux		LUM. NOIRE S/N 16460 ☐ PUISS. > 1000 µ W/cm² ☐ AMBIANT < 2 fc	
PÉNÉTRANT : Zyglo ZL-67	TEMPS PÉNÉTRATION MIN. 10 MIN.	ÉQUIP. LUMIÈRE ☐ LAMP.POCHE ☐ LAMP.CLASSE ☐ PUISS.>100 fc @ SURFACE	
DISSOLVANT PÉNÉTRANT H2O	TEMPS SÉCHAGE MIN. >10 MIN.	AUTRES	DATE CAL DUE
RÉVÉLATEUR SKD S-2	TEMPS PÉNÉTRATION MIN. 10 MIN.	MÈTRE LUM. N/S	
TYPE RÉVÉLATEUR ☑ NON AQUEUX ☐ AQUEUX ☐ SEC			
SURFACE INSPECTÉE	☑ MACHINÉE ☐ GRENAILLÉE	☑ MÉTAL PROPRE	
CONDITION SURFACE ☐ MEULÉE ☐ SOUDÉE	☑ 10°C/50°F DE 52°C/125°F	☐ > 52°C/125°F	
TEMPÉRATURE SURFACE ☐ < - 4°C/ 20°F ☐ - 4°C/ 20°F DE 10°C/50°F			

RÉSULTATS (☐ MÉTRIQUE ☐ IMPÉRIAL)

See other sheet
For result

P/O 17031

SIGNATURES

REPRÉSENTANT	Tom Titley (MOULÉ) SIGNATURE	FTJ #
TECHNICIEN (SIGNATURE):		RAPPORT RÉVISÉ PAR: NOM INITIALES
NOM (MOULÉ): Pierre-Luc [illegible]	1ER TECHNICIEN ONGC NIVEAU 2 SNT NIVEAU 2 ONGC Nº REG. 12205	2IÈME TECHNICIEN ONGC NIVEAU SNT NIVEAU ONGC Nº REG.

H-3

BLANCHE – COPIE DU CLIENT JAUNE – COPIE DU BUREAU ROSE – COPIE DU TECHNICIEN OR – COPIE DU BUREAU

PT Décembre 200